Synthesis and electrical properties of Zn-substituted bismuth copper tantalate pyrochlores

ABSTRACT

A complete substitutional solid solution, $Bi_{3.08}Cu_{1.84-x}Zn_xTa_{3.08}O_{14.16}$: $0 \leq x \leq 1.84$, was prepared by solid-state reaction at temperature 950°C over 48 h. These thermally stable pyrochlores exhibited a remarkable transition from semiconducting to highly insulating behavior as their electrical conductivities varied by many orders of magnitude depending on the Zn concentration. The recorded activation energies increased from 0.40 to 1.40 eV, while the dielectric constants, ε′, and losses, tan δ, were in the range 50–70 and of order 10^{-3}–10^{-2} at 1 MHz and ambient temperature, ~25°C, respectively.

Keyword: Impedance; Electroceramics; Solubility; Tantalum/tantalum compounds

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